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NATIONAL DAM SAFETY PROGRAM. LAUREL SPRINGS DAM (NJ00400), DELA--ETC(U)
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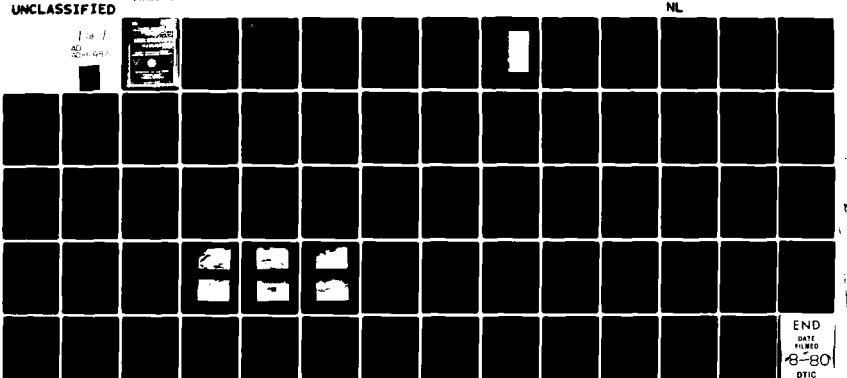

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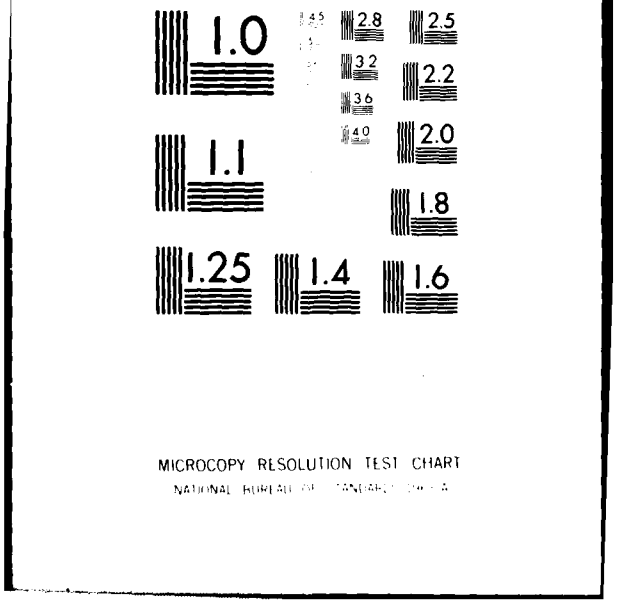
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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

2 JUN 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Laurel Springs Dam in Camden County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Laurel Springs Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to ensure the continued functioning of the dam and its impoundment, ~~the following~~ remedial actions ~~could be undertaken:~~ are recommended.

a. Backfill and protect the eroded areas behind the wingwalls of the bridge and spillway with slope paving or riprap.

b. The downstream stilling basin should be refilled with heavy stone or broken concrete to lessen the undercutting potential.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Florio of the First District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NAPEN-N
Honorable Brendan T. Byrne

This report should prove of value to the dam's owner in that a format for future inspection is provided. Maintenance items, similar to the suggested remedial actions, will periodically develop, requiring attention by the owner.

Sincerely,

James G. Ton

1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

LAUREL SPRINGS DAM (NJ00400)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 21 November 1979 by Louis Berger and Associates, Inc., under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Laurel Springs Dam, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to ensure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Backfill and protect the eroded areas behind the wingwalls of the bridge and spillway with slope paving or riprap.

b. The downstream stilling basin should be refilled with heavy stone or broken concrete to lessen the undercutting potential.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 30 May 1980

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Laurel Springs Dam Fed ID# NJ 00400
NJ ID# 31-36

State Located New Jersey
County Located Camden
Coordinates Lat. 3949.1 - Long. 7500.9
Date of Inspection 21 November 1979

ASSESSMENT OF GENERAL CONDITIONS

The Laurel Springs Dam is assessed to be in a good overall condition and it is recommended to be downgraded from a high hazard to a low hazard category. Overtopping of the dam would probably not result in loss of life or cause significant damage to downstream property since the downstream flood plain is essentially undeveloped. No detrimental findings were uncovered to merit further study, either of a structural or hydraulic nature. Remedial actions to be undertaken in the future includes regrading and protecting the slopes behind the wingwalls and refilling the downstream stilling basin at the edge of the splash apron sheeting. Also, the legal ownership of the dam and division of maintenance responsibility should be clarified.

The spillway capacity is adequate and meets the requirements of the Recommended Guidelines for Safety Inspection of Dams, being able to accommodate the 100-year frequency Spillway Design Flood (SDF).

Rudolph Wrubel
Vice President
Louis Berger & Associates, Inc.

OVERVIEW OF LAUREL SPRINGS DAM

November, 1979

TABLE OF CONTENTS

FIGURES

APPENDIX

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: LAUREL SPRINGS DAM FED # NJ 00400

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Engineer District, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Laurel Springs Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Laurel Springs Dam consists of a double-walled system of steel sheet piling which forms a straight crest and arched apron slab immediately downstream from Camden County Bridge No. 7D-9 which carries Laurel Road over the North Branch of Big Timber Creek. The ends of the piling system tie into the bridge approach embankment just behind the flared concrete wingwalls. The sheeting is capped with 8" channels. The sheeting is driven to approximately El. +8 and provides a total crest length of 66 feet. One 3'-0" Rodney-Hunt slide gate is installed in the spillway face and provides additional discharge capacity. The curved lower row of sheeting is downstream of the crest sheeting at a distance varying from 7 feet at the abutments to 10 feet at the center. A concrete cap and apron slab (at El. 18.8) connect the two rows. County Bridge No. 7D-9 has a clear span of 30 feet and is 68 feet

wide (including sidewalks). The roadway approaches form the embankment portions of the dam which has an overall length of approximately 200 feet.

b. Location

Laurel Springs Dam is located on Laurel Road (County Route 673) on the Borough Boundary of Stratford, Lindenwold, and Laurel Springs, Camden County, New Jersey and is 0.5 miles north of the intersection of Laurel Road and Clementon - Chews Landing Road (Route 683).

c. Size Classification

The overall height of the dam is 21± feet at the spillway and the maximum storage is estimated to be 422 acre-ft. Therefore, the dam is placed in the small size category as defined by the Recommended Guidelines for Safety Inspection of Dams (maximum storage less than 1,000 acre-feet and a height less than 40 feet).

d. Hazard Classification

Based upon the Corps of Engineers criteria and the fact that in the event of a failure little damage would be sustained by downstream property or endanger human life, the classification of the dam is recommended to be downgraded to a low hazard category. With a natural developed channel downstream with little adjacent construction a failure would cause little damage except to the dam itself. The nearest downstream facility is the Stratford sewage disposal plant which is 0.7 mile downstream.

e. Ownership

The dam is apparently jointly owned by the Boroughs of Laurel Springs, Lindenwold and Stratford. During the 1941 and 1960 reconstruction, Laurel Springs claimed title but it is doubtful that this Borough owned a facility within another Borough. Further, the Stratford Military Academy owns land on both sides of the North Branch although their property holding is bifurcated by the Borough Boundary. Therefore, the true legal owner is unclear without extensive title search with prior interborough agreements.

f. Purpose of Dam

This structure was originally installed to supply water power for a gristmill on the site but is now solely used to impound a recreation lake.

g. Design and Construction History

The original construction date of the dam is unknown. First documented information states the dam was repaired in 1937 after damage to timber gates. The flood of September 1, 1940 washed out the spillway abutments and the failure was in part blamed on the unexpected release from an upstream dam. In addition, the existing roadway bridge structure was extensively damaged. As a result, a new roadway bridge was constructed in 1941 by the Eisenberg Construction Company (Cty. Br. 7D-9) and the breached area reconstructed incorporting a timber cut-off wall. In addition the existing timber gate structure was rehabilitated. In 1954, local residents complained about the deterioration of the timber gates. An inspection by State Engineers concurred and suggestions were entertained for the installation of new gate timbers. However, no action was taken. Further State inspections in 1960 revealed numerous temporary repairs along with serious leaks in the spillway abutments. The lake was ordered drawndown to elevation +21 until repairs were made. After much correspondence and financial problems, the present spillway structure was constructed in 1963.

h. Normal Operating Procedures

The dam forms Laurel Springs Lake and normal operations are minimal as the reservoir has considerable freeboard and landscaped banks.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Laurel Springs Dam is 7.3 square miles.

b. Discharge at Dam Site

A non-damaging spillway capacity with the reservoir at the top of the steel sheeting wingwalls (El. 29.5) is 2,254 cfs. For maximum capacity, see Section 5. No discharge records are available at this site.

c. Elevation (above M.S.L.)

Top of dam - +37.6± (bridge deck elevation)
Recreation pool - +24.3
Streambed at Centerline of Dam - 16.7

d. Reservoir

Length of Recreation Pool - 2,800 feet
Length of Maximum Pool - 5,200 feet

e. Storage

Recreation Pool - 51 acre-feet
Top of Dam - 422 acre-feet

f. Reservoir Surface

Top of Dam - 60 acres
Recreation - 14.1 acres

g. Dam

Type - Earth highway embankment with steel sheeting spillway affixed to highway bridge wingwalls.
Length - 200'+
Height - 29.6'± (bridge deck to approx. sheeting tip)
Freeboard between normal reservoir and top of dam - 13.3'
Top width - 68'
Side Slopes - 1½H:1V d/s; 1H:1V u/s (varies)
Zoning - None

h. Diversion and Regulating Tunnel

None

i. Spillway

Type - Steel sheeting, sharp crested weir
Length - 66'
Crest elevation - 24.3' (8' notch)
24.8' (remaining 58' crest)

j. Regulating Outlets

1 - 3'x3.5' Rodney Hunt slide gate in spillway face
Inv. El. +19.09

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Contract plans for the 1963 spillway and embankment repairs were available and indicated all dimensions and major detail of that reconstruction. No plans or details were available for the 1941 construction of Camden County Bridge No. 7D-9, however, rough dimensions are found on the spillway plan sheets. The contract plans prepared in 1963 were by John G. Reutter Associates and filed with Application No. 506. No design computations were available.

2.2 CONSTRUCTION

The dam was purportedly constructed in accordance with the design although no as-built drawings were located. From the overall appearance, the sheeting appears to be driven to the depths indicated into the underlying loadbearing stratum of sandy clay. The dam lies within an irregularly shaped boundary between the geologic zones of the outer and inner Coastal Plain and is situated over a narrow intrusion of the Hornerstown Marl formation into the Kirkwood Sand Formation. The surficial soil within the immediate area of the lake and extending east and west (along the Hornerstown formation) is a sandy clay. The depth of this material is generally greater than ten feet. Underlying the sandy clay and existing as surficial soil in the higher elevations to the north and south is the fine micaceous quartz sand of the Kirkwood Sand formation. There are no records of the State inspection during the construction or approvals of the hydraulic considerations established at that time. Depth to bedrock is in excess of 100 feet.

2.3 OPERATION

The dam appears to be functioning satisfactorily as designed and built. There is no day to day adjustment of the sluicegate.

2.4 EVALUATION

a. Availability

In view of the size and hazard condition, the availability of design data is considered satisfactory for conducting the Phase I Inspection and evaluating the safety of the dam.

b. Adequacy

Referring to the above, the engineering data is deemed to be adequate for the analysis required herein. However, nothing is known about the existing County bridge.

c. Validity

The information regarding the steel sheeting in the spillway is considered valid as the field inspection revealed nothing to challenge the available data and is therefore accepted without recourse to further investigation.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspections were conducted on 21 November 1979 and 6 February 1980 when modest flows were being discharged over the spillway. The physical condition of the roadway embankment appears very stable and the road profile is well above the maximum flood elevation and is extremely broad in relation to its height. Consequently, the inspecting engineers were primarily concerned with the condition of the steel spillway structure which abuts the westerly wingwalls of the County highway bridge.

b. Dam

The road embankment each side of the 30 foot bridge is on a sag vertical curve centered on the bridge and rises rapidly so the overall effective length of dam (200'±) is very approximate. The normal terrain each side of the natural river gorge is quite steep and the only visible problem is the slight surficial erosion that has occured at the bridge wingwalls and behind the steel sheet-piled spillway. Some concrete rubble and plywood slope boards have been placed to retard the erosion but this appears to be only partially effective. There has apparently been little upkeep of the bridge approach embankment slopes in recent years but their condition is basically stable although the roadway run-off is a continuing problem.

c. Appurtenant Structures

The steel sheeting and the 7-10 foot wide concrete apron slab are in satisfactory condition although the apron and cut-off wall are continually submerged. There was no evidence of adjacent seepage because the original ground areas immediately downstream from each side of the roadway embankment are above spillway crest elevation. The roadway approach sections to the bridge which form the embankment portion of the dam are considerably higher than that dictated by hydraulic considerations. The road shows evidence of widening and repaving. The interlocked steel sheeting spillway which regulates the impoundment is, in effect, an addition to the

bridge structure. The bridge was apparently designed to handle the normal flow of the North Branch of Big Timber Creek and to keep the roadway above maximum flood elevation.

The hydraulic opening of the 30 foot bridge is more than adequate, having in excess of 10 feet of freeboard above the weir crest. The superstructure is in good condition but a collapse of the deck could substantially clog up the waterway opening underneath. On the downstream side of the bridge, a 15 inch water (or sewer) line is fastened to the fascia. There are chain-link fences constructed on each side of the roadway. The bridge abutments and wingwalls are of solid construction and most probably are founded on piles in view of sandy clay foundation material. Their plumbness and alignment are true.

The sluice gate has not been adjusted in several years but is reportedly in operative condition although its wheel could not be located. Its use is apparently restricted to dewatering the lake. The steel sheeting could not be closely observed but it appears to be properly interlocked and driven plumb. The channel cap on the north wing is cracked at the welded splice but this can be easily repaired. The sheeting on the wings is a MP115 section and has more than sufficient section modulus for the exposed height and configuration. The plans indicate the spillway wall sections are MZ27 while the cut-off wall of the concrete splash apron are MP112.

d. Reservoir

The lake has a well established and naturally wooded shoreline. There are several homes near the roadway elevation, especially on the southeast corner, immediately above the dam bridge. The natural slopes are fairly steep (2 to 3H:1V) and there is some evidence of silting along the shores. Slightly over a mile above Laurel Lake's headwaters, there are three other dams which could effect the overall hydraulics of this reach of the North Branch (see Section 5).

e. Downstream Channel

The North Branch flows unimpeded several miles to the northwest after discharging over the study dam into a steep-banked natural flood plain which is essentially undeveloped except for the sewage treatment plant located at the juncture of the North Branch and Mason Run. All adjacent homes and the nearby Stratford Academy, located west of the right abutment, are well above high water elevation. A small wooden footbridge is located just below the spillway but has negligible hydraulic effect on the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Nothing was observed by the inspection team regarding operational procedures. The sluice gate has apparently been inoperative for several years as the dam functions completely as an uncontrolled overflow structure.

4.2 MAINTENANCE OF DAM

The roadway embankment and bridge are maintained by Camden County in a workmanlike fashion as part of their continual road program.

4.3 MAINTENANCE OF OPERATING FACILITIES

The maintenance of the facilities is periodically performed by local township road crews.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

None exists except for monitoring by County and Borough personnel during heavy storms.

4.5 EVALUATION

Although there are no operational procedures or safeguards, in view of the position of the dam the overall evaluation is deemed satisfactory except for the lack of an emergency action plan as set forth in Section 7. Further, the ownership responsibility of maintenance should be clarified in the future notwithstanding the fact that the dam is presently operating satisfactorily.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Based on the Recommended Guidelines for Safety Inspection of Dams, the dam at Laurel Springs is of small size and low hazard, and consequently a 100-year storm was selected for review of the spillway hydraulics. Inflow to the reservoir was estimated utilizing precipitation data from Technical Publication 40 and NOAA Tech. Memo NWS Hydro-35 by the HEC-1 program which yielded a peak inflow of 1,690 cfs. Routing this storm through the reservoir reduced the discharge flow slightly to 1,640 cfs. As evident in the appended design calculations and incorporated in the discharge capacities, the spillway weir, being considerably wider than the bridge opening, is not the controlling element. The spillway capacity of 2,254 cfs can accommodate the design flood and is therefore adequate.

b. Experience Data

Although the dam has failed twice, no actual storm flows have been recorded. An eye-witness to the 1941 failure estimated that just before the embankment was breached, a high water elevation of +32 was attained which was approximately 6 inches over the existing embankment (the present crest is El. 37.6 at its low point). The 1941 Dam Application indicated an estimated flood runoff to be 1,080 cfs using a Central Jersey Curve but there is no currently available field substantiation for this discharge.

c. Visual Observations

The spillway and bridge structures appear in satisfactory hydraulic condition. Little downstream scour was observed, indicating both low flows and the proper functioning of the stilling basin, energy dissipating blocks, and width of downstream splash apron.

d. Overtopping Potential

All known overtoppings have taken place prior to the 1963 spillway reconstruction and since the current spillway can accommodate the design flood, there is only a marginal potential for damaging overtopping. The depth of flow for the SDF is roughly 3.7 feet above the spillway crest, leaving about 6 feet of freeboard to the highway bridge soffit.

e. Drawdown Potential

At the present time, drawdown is not immediately possible as the operating mechanism for the 3'x3.5' sluicegate is missing. Utilizing this gate, it is estimated that drawdown to el. +18.0, (roughly the lake bottom), would take approximately 9 hours.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The interlocked steel sheet piling is in good condition although the welding details at the top channel cap are not in the best standard practice. The concrete slab is continually submerged so it could not be closely observed. However, there has been no appreciable shifting or settlement of the structure and the apron is adjudged to be structurally intact. The normal flows thru the structure are modest and little evidence of downstream scour was noted although the channel immediately below the spillway should be backfilled. The exposed surfaces of the sheeting show little signs of excessive oxidation and appear to be of a good grade of marine steel. Due to the double-walled configuration, and monolithic caps, bending stresses are quite low. The concrete bridge abutments which form an integral part of the dam structure are in satisfactory condition. They exhibit no appreciable differential settlement or tilting and appear to be very conservatively designed.

b. Design and Construction Data

Although design information was not available, due to the depth of sheeting and its configuration, the spillway is felt to be more than adequate for the hydraulic loads involved. Certainly, as long as no further downstream scouring is allowed to undercut the outfall sheetline, bending stresses are extremely low and of little concern. Nothing is known regarding difficulties encountered during construction. As previously stated, nothing could be located regarding the design of the roadway bridge, but its excellent condition, except for the salt deterioration of the sidewalls, make its assessment of no major concern to the inspection team.

c. Operating Records

See Section 4. According to State records, the operation of this dam has been satisfactory, since its 1963 rehabilitation.

d. Post Construction Changes

There is no record of any structural modifications since the final reconstruction was completed.

e. Seismic Stability

The dam is in Zone I and due to its location, geometry and size, has negligible potential earthquake vulnerability as it is statically stable. Experience indicates dams with adequate stability under static loads will have adequate stability under dynamic loadings.

SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ PROPOSED REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Laurel Springs Dam is assessed to be in an overall safe structural and hydraulic condition. It forms an artificial pond of less than 15 acres and was built principally to form a recreation lake. The spillway can safely withstand a reservoir head up to the tops of the wingwalls and there is little likelihood that the roadway and embankment which forms the dam could ever be overtopped. Summarizing the hydraulic considerations in Section 5, there is minimal downstream hazard should the spillway structure collapse. Consequently, the dam is downgraded to a low hazard category. The appended computations show that the structure can accommodate the 100 year frequency SDF. No detrimental findings were revealed in this inspection to render a questionable judgement as to the hydraulic or structural adequacy.

b. Adequacy of Information

The information gathered for the Phase I inspection is deemed to be adequate regarding the safe operation and structural stability of the dam, especially in view of the hydraulic conclusions contained herein.

c. Urgency

Further studies are deemed unnecessary and it is recommended that the remedial measures set forth below be taken under advisement in the future.

d. Necessity for Further Study

Additional inspections are believed to be unnecessary as the dam does not constitute a hazard to human life or to be a danger to downstream property should it collapse.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommendations

It is recommended that the eroded areas behind the wingwalls of the bridge and spillway be backfilled and protected with slope paving or riprap. Further, the downstream stilling basin should be refilled with heavy stone or broken concrete to lessen the undercutting potential.

b. O&M Maintenance & Procedures

The status of the ownership and responsibility of maintenance of the spillway should be clarified, at least in the records of the Division of Water Resources (see Section 4.5). No current procedures other than those currently in effect are warranted in view of the assessment contained herein but the owners should develop an emergency action plan in concert with the upstream dam owners so that downstream flooding effects can be minimized.

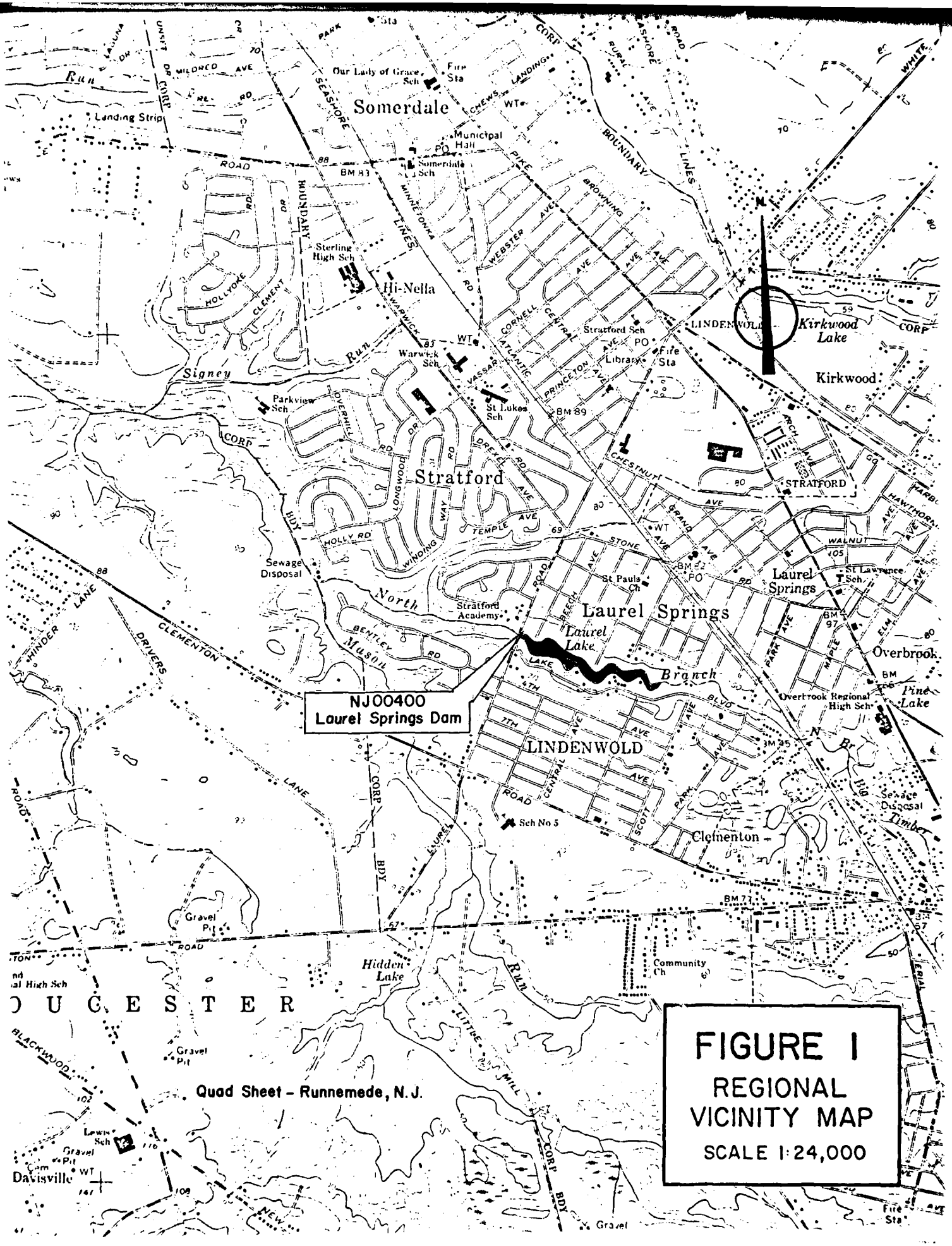
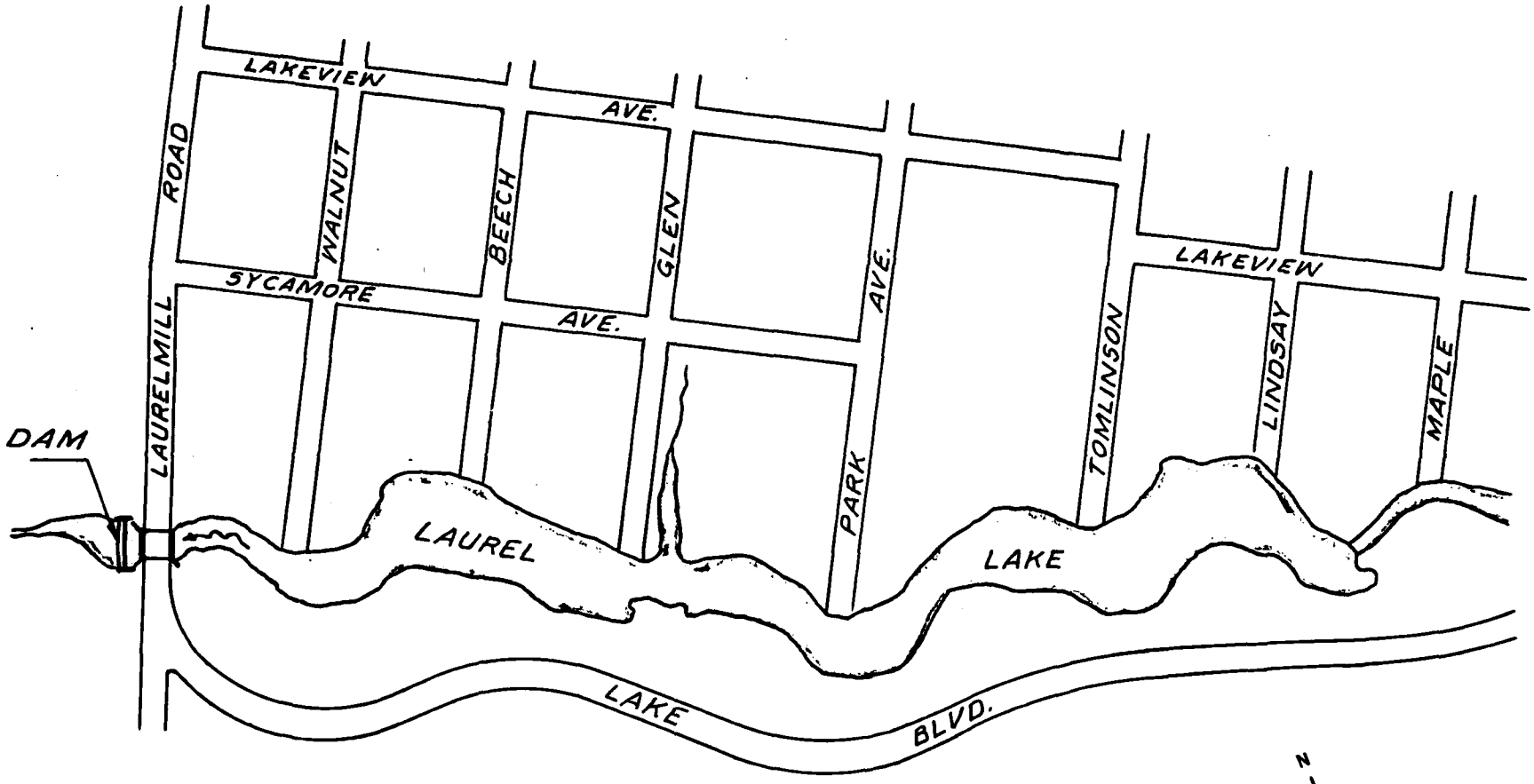


FIGURE 1
REGIONAL VICINITY MAP
SCALE 1:24,000



LOCATION PLAN

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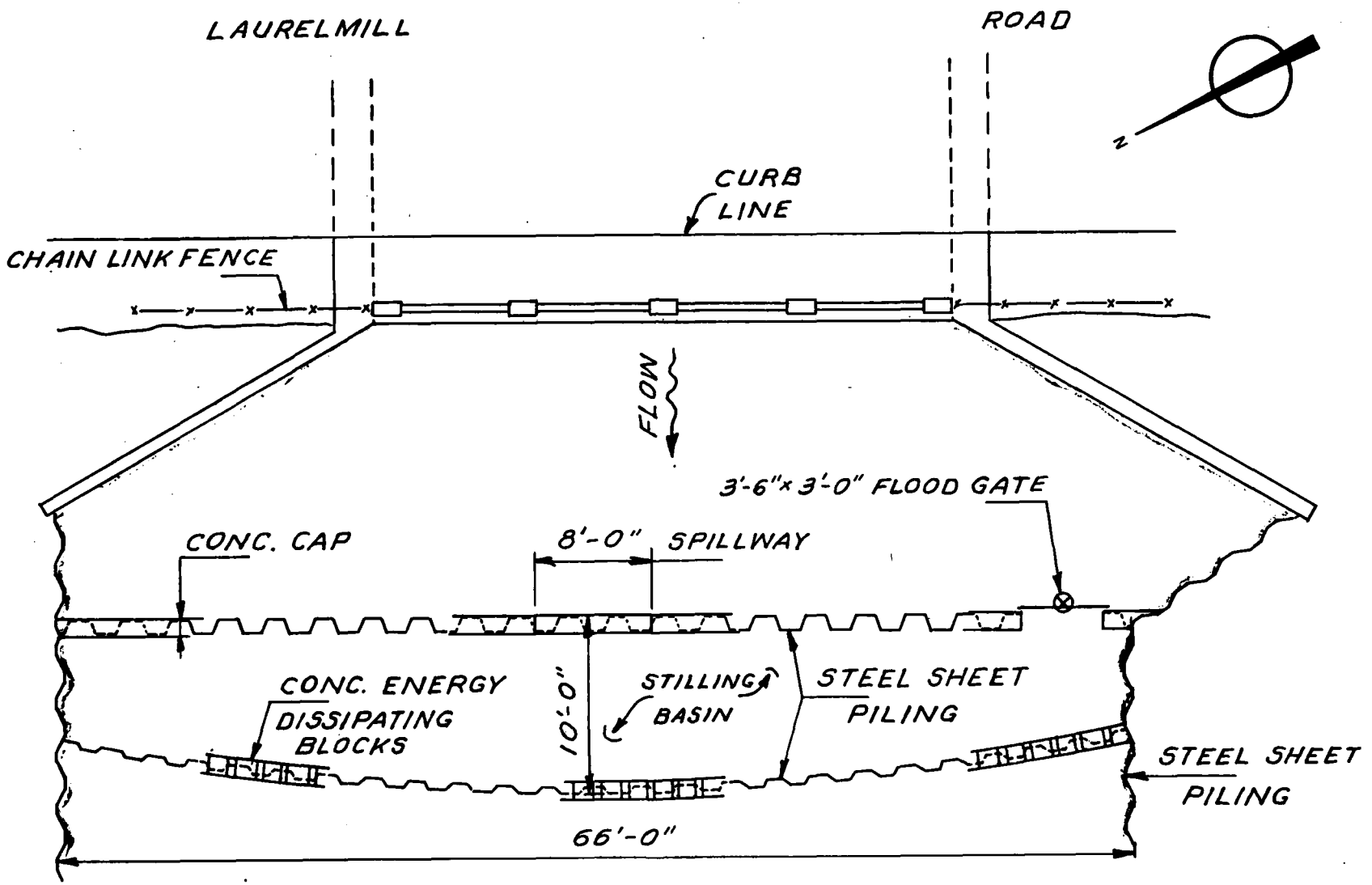
FIGURE 2



PLAN
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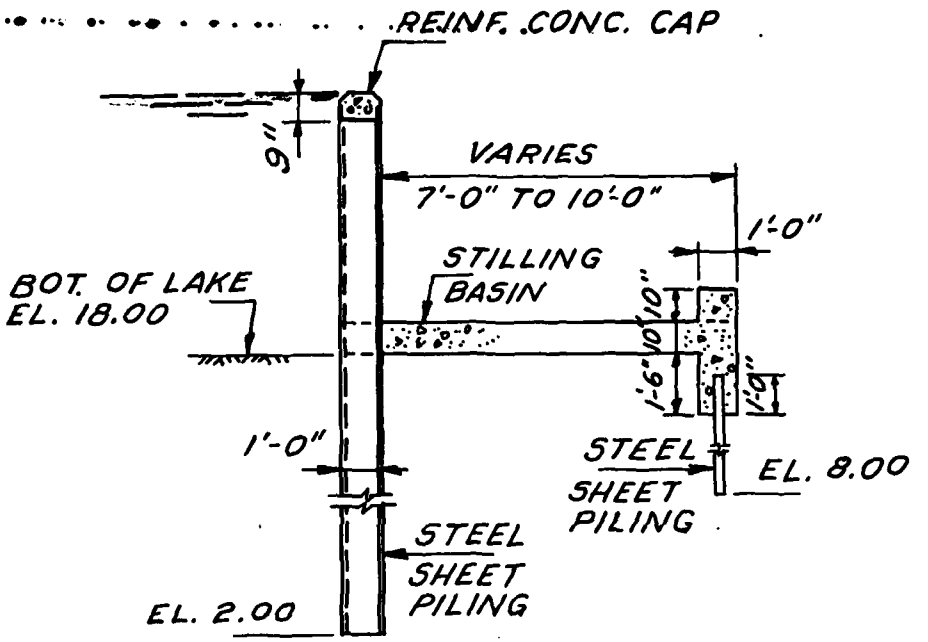
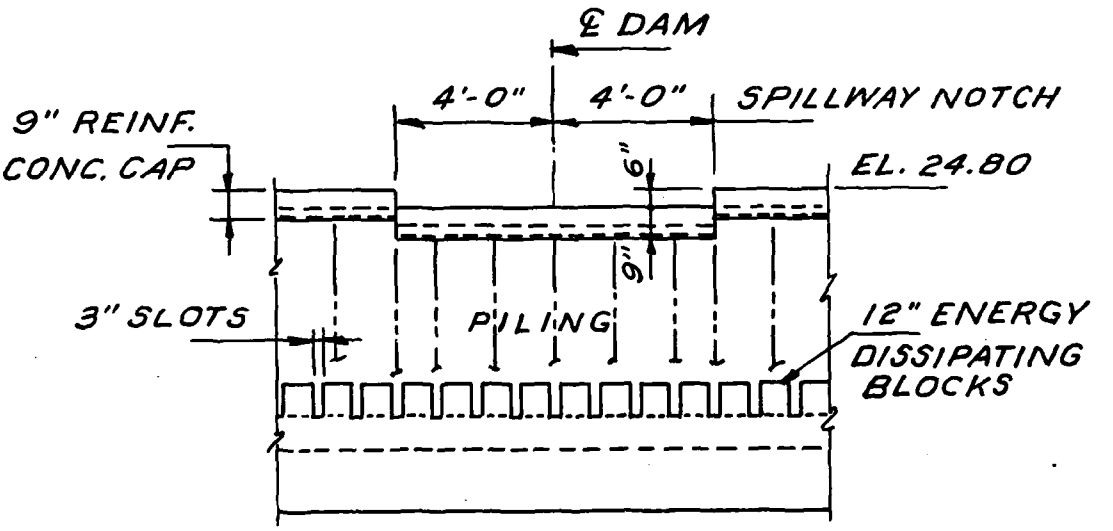
FIGURE 3



SECTION THRU SPILLWAY



SPILLWAY ELEVATION

FIGURE 4

Check List
Visual Inspection
Phase 1

Name Dam Laurel Springs County Camden State New Jersey Coordinators NJDEP

Date(s) Inspection 11-21-79, 2-6-80 Weather Clear Temperature 55°

Pool Elevation at Time of Inspection +24.3 M.S.L. Tailwater at Time of Inspection +18.0 M.S.L.

Inspection Personnel:

L. Baines J. Voorhees

E. Simone K. Jolls

R. Lang

R. Lang Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Concrete Roadway Bridge. Camden County Bridge no. 7D-9. Built 1941 by the Eisenberg Construction Co. S. Herbert Taylor - County Engr.	Concrete in good condition.
DRAINS	Roadway drains (Ø18"±) discharge into side of bridge. 4"Ø drains in main bridge walls.	Total of 8 roadway drop inlets on either side of bridge.
WATER PASSAGES	County water pipes 14"Ø on either side. 30' wide bridge opening.	Approx. 4' above soffit.
FOUNDATION	Unknown, see plans.	Probable timber piling.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Heavy spalling and some cracking in sidewall on east side, could possibly be from winter salt and ice.	
STRUCTURAL CRACKING	Large crack N.E. Bridge rail post.	Possibly due to auto impact.
VERTICAL AND HORIZONTAL ALIGNMENT	Very good, roadway embankment. 30' wide opening. Some debris in spillway basin.	
MONOLITH JOINTS	Satisfactory	
CONSTRUCTION JOINTS	Satisfactory	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Numerous trees on U/S embankment.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	On U/S embankment, toe erosion evident especially SE side large tree (18"Ø) appears to be helping to hold embankment in place. Concrete scraps have been placed in an effort to protect against further slumping and possible wave action of lake.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Behind SE wingwall, due to street runoff, some patching evident but not effective, a dozen or so trees on U/S embankment.	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Good, highway embankment.	
RIPRAP FAILURES	None - Asphalt slope protection at NE wingwall, good placement.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good, slopes covered with vegetation appear stable. No elevation difference at junction of embankment and bridge deck slab.	
ANY NOTICEABLE SEEPAGE	None	
STAFF GAGE AND RECORDER	On S.E. wingwall, level reading of 0.80.	
DRAINS	None	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None, entire outlet structure is steel sheeting.	
INTAKE STRUCTURE	Submerged 36" Rodney Hunt slide gate in spillway face.	Operating handle not present. Operating condition unknown.
OUTLET STRUCTURE	Concrete stilling basin at outlet of slide gate. 7'-10' wide (varies).	
OUTLET CHANNEL	Clear, but for timber foot bridge 40' downstream.	
EMERGENCY GATE	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Sharp crested weir, steel sheet piling. Concrete cap on top of piling 1 ft. wide.	
APPROACH CHANNEL	Concrete highway bridge directly upstream of spillway, above that is Laurel Lake.	
DISCHARGE CHANNEL	Natural channel about 30' wide, clear of obstructions.	Slopes rise 1H:1V on either side, overgrown.
BRIDGE AND PIERS	Old wooden foot bridge 40'± below spillway 3 piers in channel 12'± above water surface.	Could possibly create downstream blockage.

Pages 7 and 8 are not available

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Fairly steep approx. 3H:1V on all sides except right near roadway on south side where private home backyard tapers down to waters edge.	
SEDIMENTATION	Some evident.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Wooden foot bridge.	
SLOPES	Flat and then steepen to 2H:1V	
APPROXIMATE NO. OF HOMES AND POPULATION	All homes well above floodplain.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Available - NJDEP - Div. of Water Resources - Bureau of Flood Plain Management - P.O. Box 2809, Trenton, New Jersey 08625
REGIONAL VICINITY MAP	Available - U.S.G.S. Quad - Runnemede, N.J.
CONSTRUCTION HISTORY	Limited amount available, primarily 1941 reconstruction - NJDEP
TYPICAL SECTIONS OF DAM	None available
HYDROLOGIC/HYDRAULIC DATA	Some available, 1941 Dam Application - NJDEP
OUTLETS - PLAN	Available 1963 Reconstruction Plans - NJDEP
- DETAILS	Available
-CONSTRAINTS	Not available
-DISCHARGE RATINGS	Not available
RAINFALL/RESERVOIR RECORDS	None available

ITEM	REMARKS
SPILLWAY PLAN	Available - 1963 reconstruction plans - NJDEP
SECTIONS	Available - " " " "
DETAILS	Available - " " " "
OPERATING EQUIPMENT PLANS & DETAILS	Available - 1963 reconstruction plans - NJDEP

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS	Some available for 1941 reconstruction - NJDEP
HYDROLOGY & HYDRAULICS	" " " " " "
DAM STABILITY	None available
SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS	None available
BORING RECORDS	" "
LABORATORY	" "
FIELD	" "
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Plans of 1941 and 1963 reconstruction available (NJDEP)
HIGH POOL RECORDS	None available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	1937, 1940 failures
MAINTENANCE OPERATION RECORDS	None available

November, 1979

View of Spillway

November, 1979

View of Left Spillway Abutment
and Slide Gate Structure

November, 1979

View of Spillway Looking Southwest

November, 1979

View Upstream Through Bridge Opening

November, 1979

View of Crest Looking Northeast

November, 1979

View of Downstream Channel

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 7.3 square miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): +24.3 MSL (51 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY):

ELEVATION MAXIMUM DESIGN POOL:

ELEVATION TOP DAM: +37.6 M.S.L. (422 acre-feet)

CREST:

a. Elevation +37.6 M.S.L.
b. Type roadway embankment
c. Width 68'±
d. Length 200'±
e. Location Spillover at center of embankment
f. Number and Type of Gates

OUTLET WORKS:

a. Type Steel sheeting, sharp crested weir
b. Location center of dam
c. Entrance inverts +24.3'± M.S.L.
d. Exit inverts +16.7± M.S.L.
e. Emergency draindown facilities 1 - 3.0' x 3.5' sluicegate

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 2,254 cfs

BY J. Schaefer DATE 1/8/80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A-1 OF

CHKD. BY DATE Laurel Springs Lake Dam Inspection NJ00400 PROJECT C246

SUBJECT HYDROGRAPH DATA

1. CLARK COEFFICIENTS FOR HYDROGRAPH FOR HEC-1 INPUT (FROM CORPS OF ENGINEERS)

$t_c = 3.9$ HRS

$R = 9.2$

2. D. A. = 7.3 SQUARE MILES
TRIBUTARY : NORTH BRANCH TIMBER CREEK

3. CLASSIFICATION : SMALL, LOW HAZARD
1 IN 100 YR. FREQ. RAINFALL

BY J.C. DATE 1/8/80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A 2 OF

CHKD. BY DATE LAUREL SPRINGS LAKE DAM NJ00400 PROJECT C246

SUBJECT DEPTH DURATION RAINFALL DATA FROM TP40

PRECIPITATION DATA FROM TP 40 (DEPTH DURATION CURVE)
1 IN 100 YEAR FREQUENCY

TIME	PRECIPITATION	Δ	REARRANGE Δ
.5	2.4	2.4	.12
1.0	3.1	.7	.12
1.5	3.7	.6	.14
2.0	4.0	.3	.17
2.5	4.22	.22	.18
3.0	4.40	.18	.22
3.5	4.57	.17	.7
4.0	4.71	.14	2.4
4.5	4.84	.13	.6
5.0	4.96	.12	.3
5.5	5.08	.12	.13
6.0	5.20	.12	.12

J.C. 1/8/80

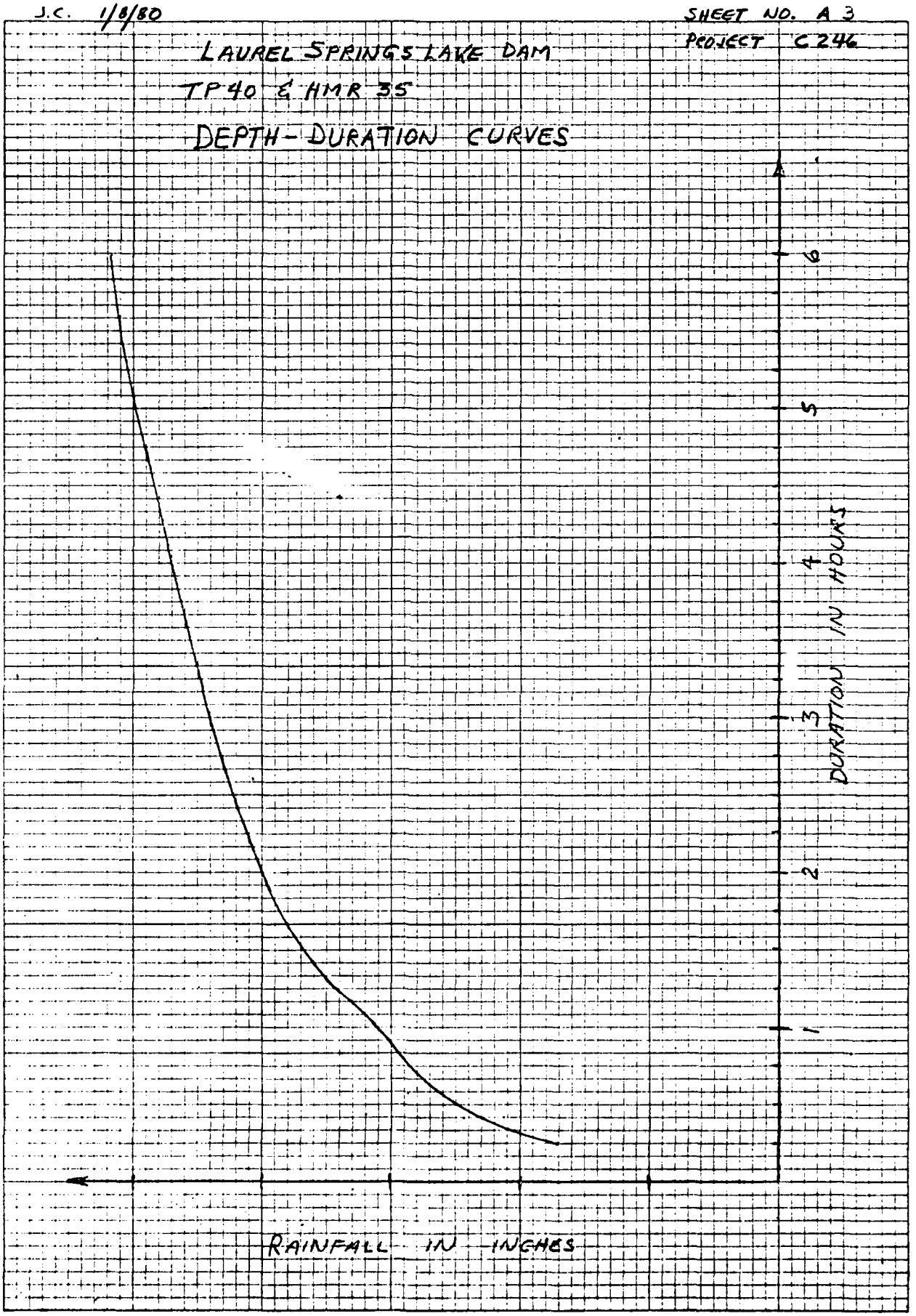
SHEET NO. A 3

PROJECT C246

LAUREL SPRINGS LAKE DAM

TP40 & HMR 35

DEPTH - DURATION CURVES



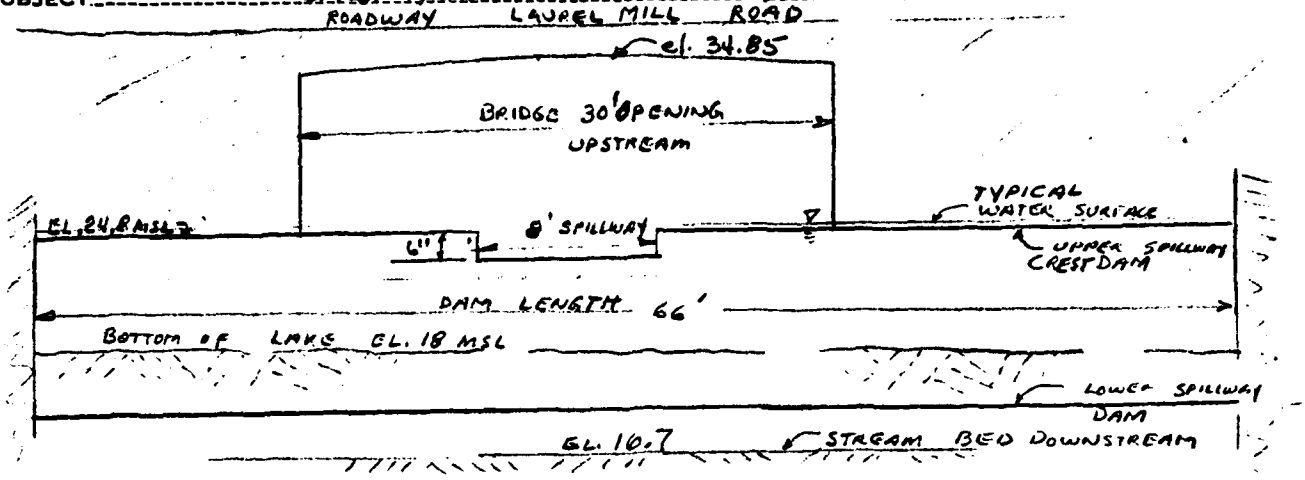
46 0706

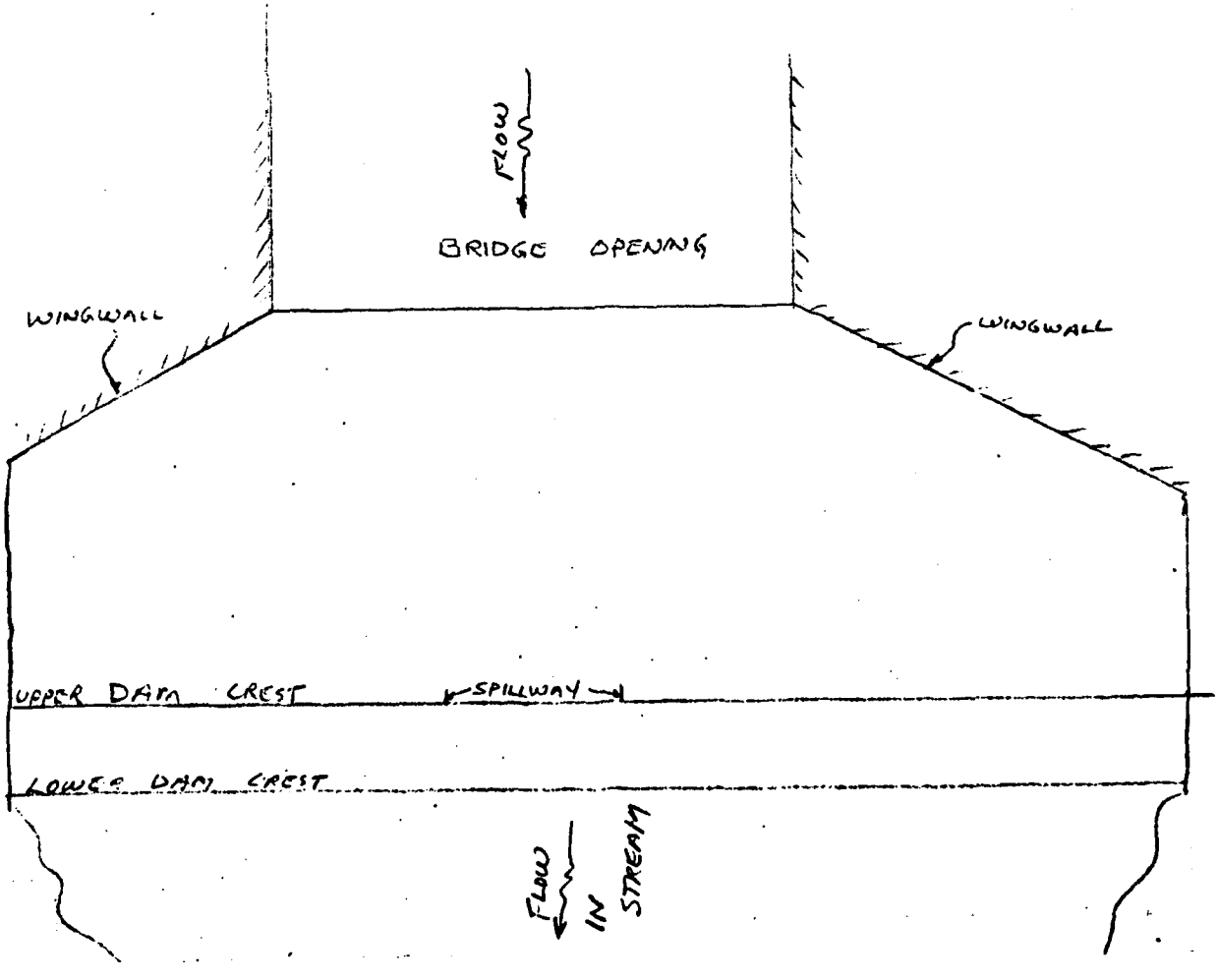
10 X 10 TO THE INCH • 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

BY J. CERAVOLO DATE 1/7/80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A-4 OF

CHKD. BY DATE LAUREL SPRINGS LAKE DAM INSPECTION PROJECT C-246

SUBJECT SPILLWAY DISCHARGE CAPACITY





BY J. C. DATE 1/7/80 LOUIS BERGER & ASSOCIATES INC. SHEET NO. A-2 OF
CHKD. BY DATE LAUREL SPRINGS LAKE DAM PROJECT S246
SUBJECT SPILLWAY DISCHARGE

FIND SPILLWAY DISCHARGE IGNORING THE EXISTING BRIDGE IMMEDIATELY UPSTREAM ON LAUREL HILL ROAD

LENGTH OF SPILLWAY NOTCH 8'
Depth OF SPILLWAY NOTCH 6" = .5'
$Q = C L H^{3/2}$ where C = 3.2 WITH END CONTRACTIONS
LENGTH OF DAM SPILLWAY = 66' TOTAL
$Q = C L H^{3/2}$ where C = 3.3 SHARP CRESTED WEIR WITHOUT END CONTRACTIONS

ELEV.	SPILLWAY NOTCH H	L	C	Q	DAM SPILLWAY H	C	L	Q	ΣQ	
24.3	0									
24.8	.5	8'	3.2	9	0				9	
25	.7	8'	3.2	15	.2	3.3	58	17	32	
26	1.7	8'	3.2	56	1.2	"	"	251	307	
27	2.7	"	"	113	2.2	"	"	624	737	
28	3.7	"	"	182	3.2	"	"	1095	1278	
29	4.7	"	"	261	4.2	"	"	1647	1908	
30	5.7	"	"	348	5.2	"	"	2270	2617	
31	6.7	"	"	444	6.2	"	"	2955	3399	
32	7.7	"	"	547	7.2	"	"	3698	4245	
33	8.7	"	"	657	8.2	"	"	4494	5151	
34	9.7	"	"	773	9.2	"	"	5341	6114	
29.5	5.2	"	"	304	4.7	"	"	1950	2254	(TOP OF STEEL PILING

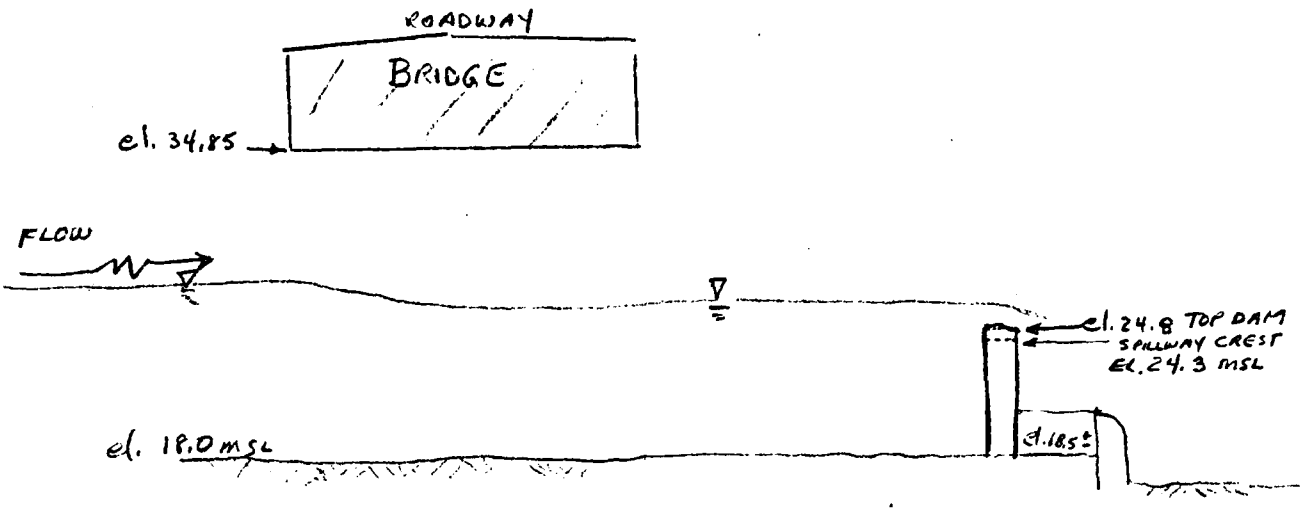
UPSTREAM BRIDGE LOSSES WILL CONTROL

CALCULATE LOSSES DUE TO BRIDGE CONSTRICTION

BY J.C. DATE 4/1/80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A6 OF

CHKD. BY DATE LAUREL SPRINGS LAKE DAM PROJECT C246

SUBJECT LAUREL HILL RD. BRIDGE DISCHARGE



ASSUME SUBCRITICAL FLOW THROUGH BRIDGE

FIND EFFECT OF CONSTRICTION LOSSES ON LAKE LEVEL USING WEIR WATER LEVEL AS WATER LEVEL THROUGH BRIDGE TO CALC. LOSSES.

Velocity Head = $V^2/2g$

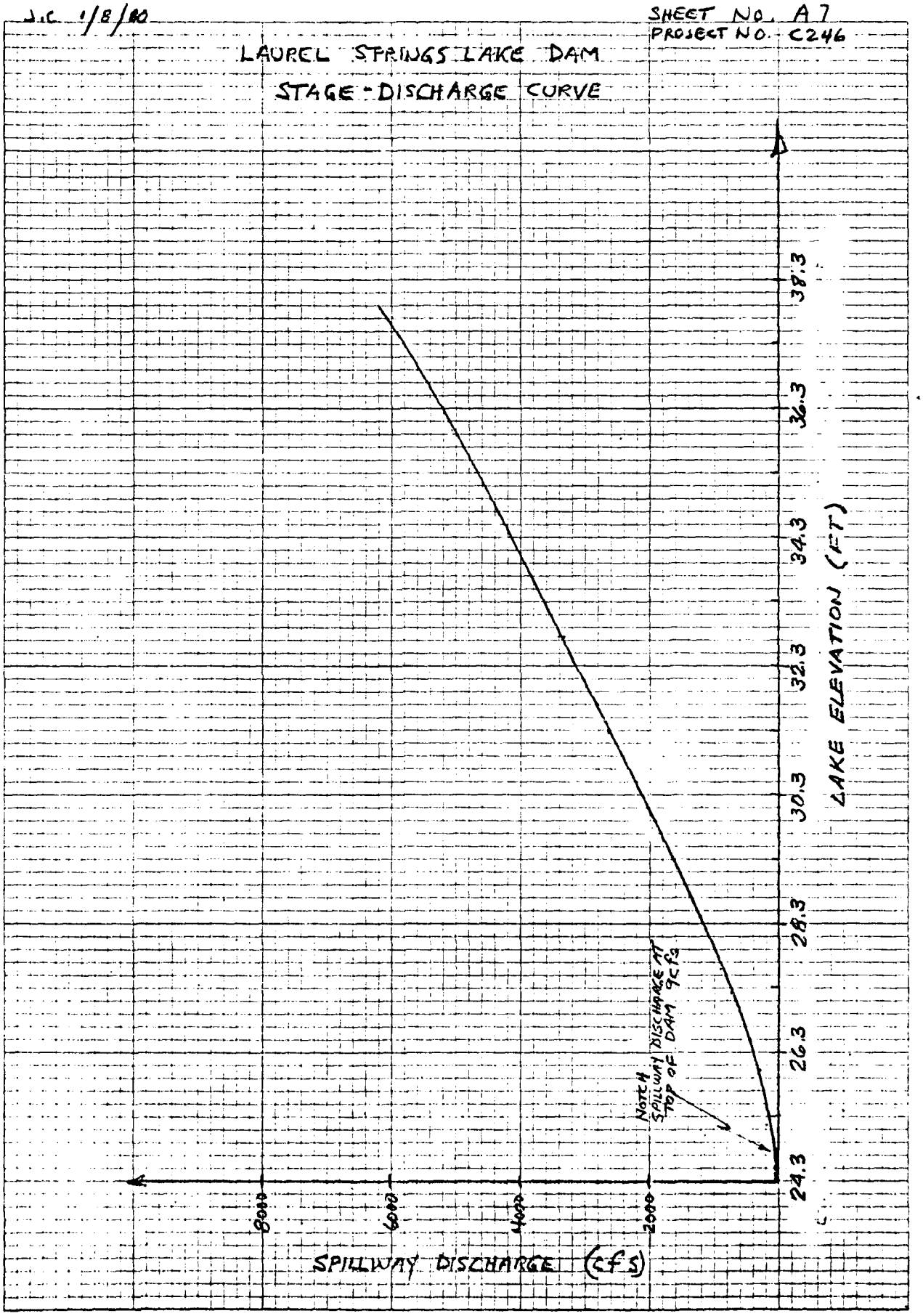
Bridge Losses = $K\,V^2/2g$ USE: $K = 1.5$ TO ACCOUNT FOR ALL LOSSES

ELEV.	For H over Spillway Crest	Area of Bridge Waterway (FT^2) (From Bot. El. 18.0)	Vel. (Ft/sec)	$V^2/2g$ (FT)	$KV^2/2g$	Lake Elev. $H+KV^2/2g$	Bridge H over Spillway Crest
24.3							
24.8	.5				0	24.8	.5
25	.7	7x30 = 210	.15	.00	0	25.0	.7
26	1.7	8x30 = 240	1.2	.02	.03	26.03	1.73
27	2.7	9x30 = 270	2.72	.11	.17	27.17	2.87
28	3.7	10x30 = 300	4.26	.28	.42	28.42	4.12
29	4.7	11x30 = 330	5.78	.52	.78	29.78	5.48
30	5.7	12x30 = 360	7.26	.82	1.23	31.23	6.93
31	6.7	13x30 = 390	8.71	1.18	1.77	32.77	8.47
32	7.7	14x30 = 420	10.1	1.58	2.37	34.37	10.07
33	8.7	15x30 = 450	11.45	2.04	3.06	36.06	11.76
34	9.7	16x30 = 480	12.74	2.52	3.78	37.78	13.48

J.C. 1/8/80

SHEET NO. A7
PROJECT NO. C246

LAUREL SPRINGS LAKE DAM
STAGE - DISCHARGE CURVE



BY J.C DATE 1/8/80 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A.8 OF

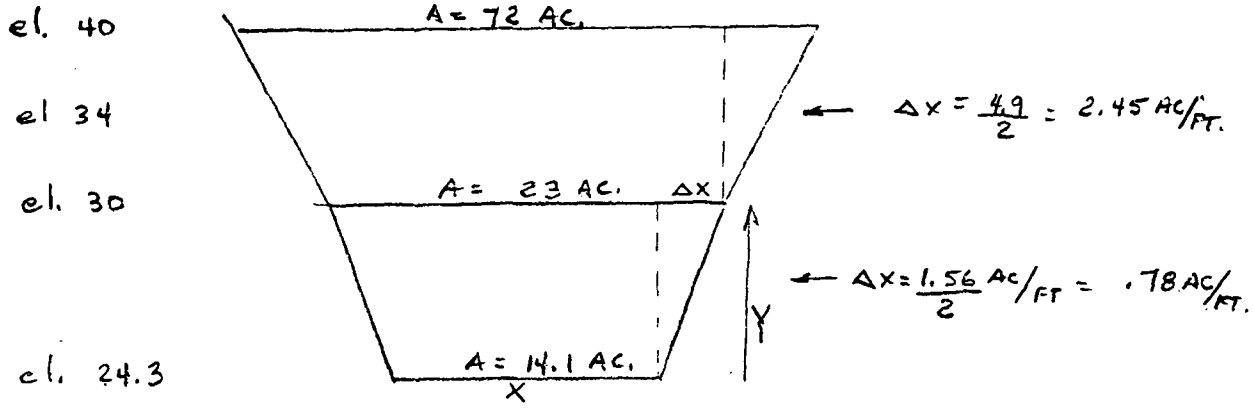
CHKD. BY DATE LAUREL SPRINGS LAKE DAM PROJECT C-246

SUBJECT SURCHARGE STORAGE

AREA LAKE @ NORMAL POOL EL. 24.3 MSL - 14.1 ACRES

AREA LAKE @ 30' CONTOUR - 23 ACRES

AREA LAKE @ 40' CONTOUR - 72 ACRES



$\Delta V = (X + \Delta X)Y$

ELEV.	HEIGHT ABOVE SPILLWAY CREST	SURCHARGE STORAGE
24.3	0	
24.8	.5	7
25	.7	10
26	1.7	26
27	2.7	44
28	3.7	63
29	4.7	84
30	5.7	106
31	6.7	131
32	7.7	162
33	8.7	197
34	9.7	237
35	10.7	282
36	11.7	332

ELEV.	H	STOR
37	12.7	387
37.6	13.3	422

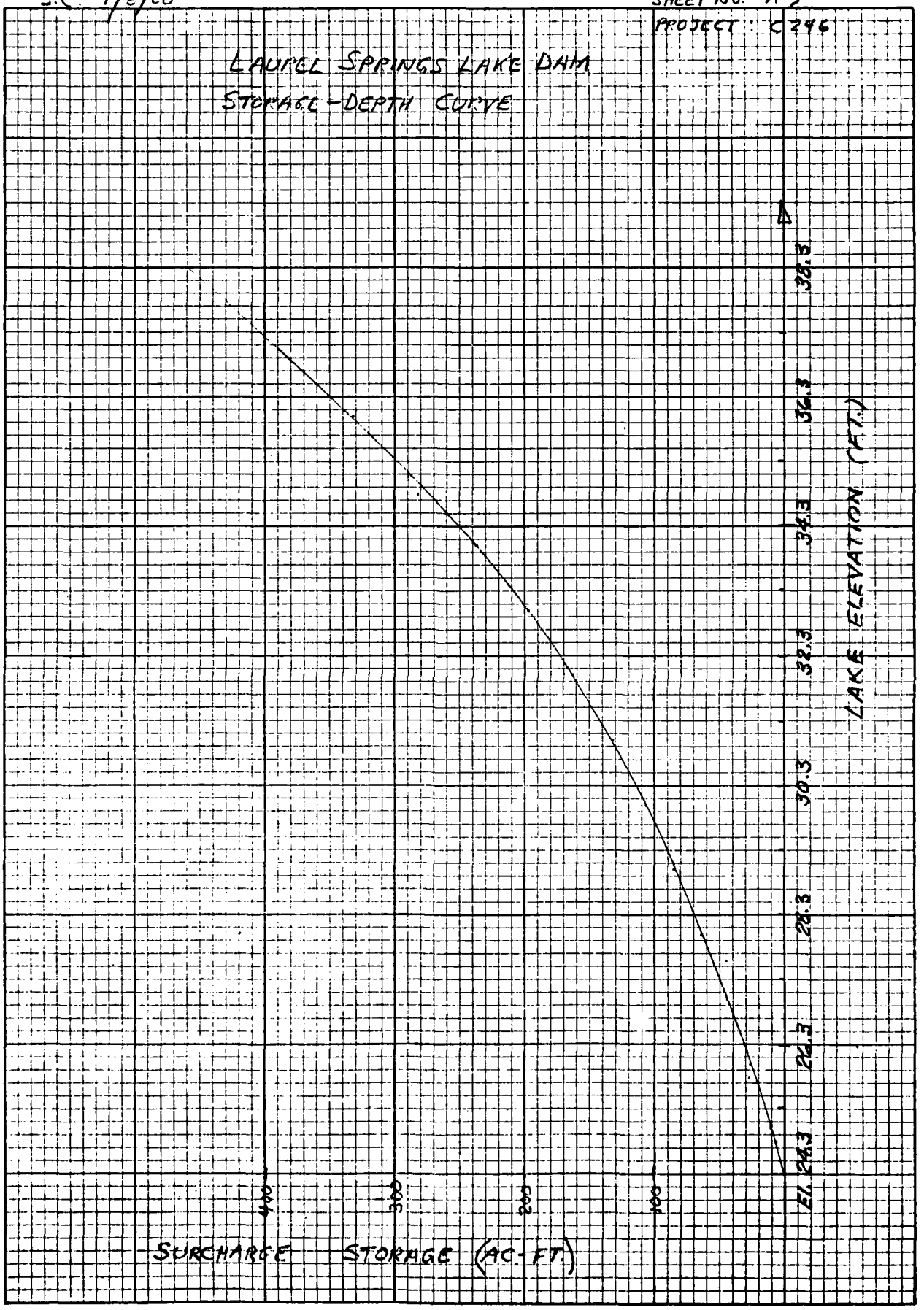
J.C. 1/8/80

SHEET NO. A 9

PROJECT : C 246

LAUREL SPRINGS LAKE DAM

STORAGE - DEPTH CURVE



BY JLC DATE 1/8/99 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A 10 OF

CHKD. BY DATE LAUREL SPRINGS LAKE DAM PROJECT C246

SUBJECT STORAGE - DISCHARGE VALUES

SUMMARY OF STORAGE & DISCHARGE DATA FOR HEC-1 COMPUTER INPUT

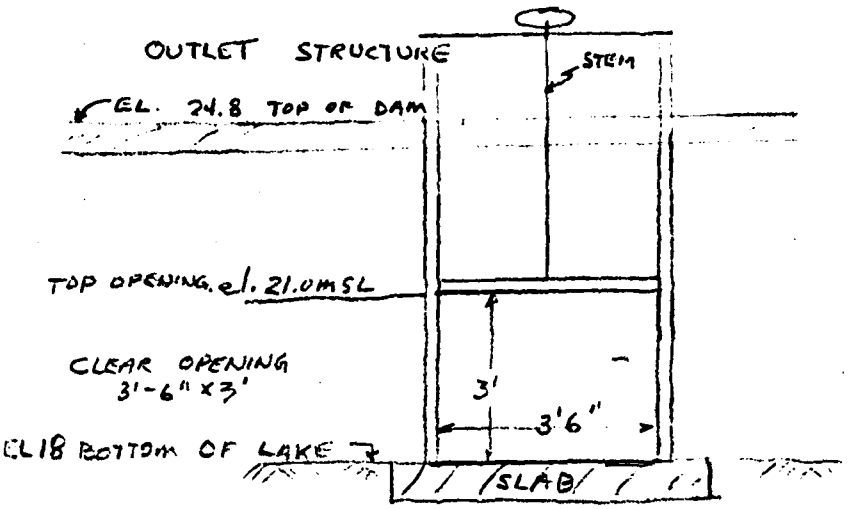
HEIGHT ABOVE SPILLWAY CREST (FEET)	STORAGE (ACRE FT)	DISCHARGE (CFS)	
0		0	
1	15	175	✓
2	32	400	✓
3	50	750	
4	68	1200	✓
5	90	1600	
6	112	2150	✓
7	140	2600	
8	170	3080	✓
9	210	3600	
10	250	4150	✓
11	300	4650	
12	350	5200	✓
13	404	5800	✓
13.5	430	6150	✓

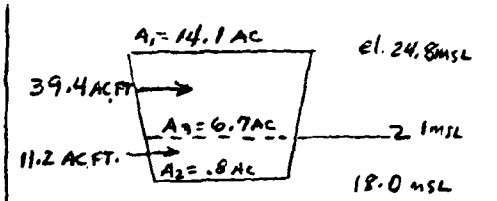
BY. J.C. DATE 1/8/82 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A 11 OF.....

CHKD. BY..... DATE..... LAUREL SPRINGS LAKE DAM PROJECT G 246

SUBJECT APPROXIMATE DRAWDOWN CALCULATIONS

VOLUME LAKE = 50.6 ACRE FT.





$\frac{A_1+A_2}{2} \times D = 50.6$ AC FT

$A_2 = .8$

$\frac{14.1 - .8}{6.8} = 1.95$ AC/FT. $\times 3 = 6.7$ AC.

$\frac{6.7 + .8}{2} \times 3 = 11.2$ AC FT.

ASSUME CONSTANT INFLOW OF 8 cfs

CONSIDER DRAWDOWN IN TWO STEPS

1. FROM TOP OF DAM TO TOP OF OPENING — ORIFICE FLOW

$Q = C a \sqrt{2gH}$ where $C = .62$, H = Havg.

KINGS HANDBOOK HYDRAULICS

2. FROM TOP OF OPENING TO BOTTOM OF LAKE — CONSTRICTED FLOW

$Q = C A \sqrt{2gH}$ where $C = .66 \pm$ CHOW OPEN CHANNEL HYDRAULICS SECT. 17-16

1. $Q = .62 \times 3 \times 3.5 \sqrt{64.4 \times H}$ $\quad H = \frac{3}{4}(5.3) = 4'$

$Q = 104.5$ cfs $- 8$ cfs $= 96.5$ cfs

2. $Q = .66 \times \left(\frac{3 \times 3.5}{2}\right) \sqrt{64.4 \times 1.125}$ — Avg. depth.
(Avg. A.)

$Q = 29.5$ cfs $- 8$ cfs $= 21.5$ cfs

APPROX. DRAWDOWN

$T = \frac{39.4 \times 43560}{96.5 \times 3600} + \frac{11.2 \times 43560}{21.5 \times 3600} = 4.9 + 4.0 = \underline{9.0 \text{ HOURS}}$

```
A   LAUREL SPRINGS LAKE DAM
A   BY J CERAVOLO
A   JANUARY 1980
B    150       0      30
1      3
K      0       1                                    1
1    SUB-AREA RUNOFF COMPUTATION
M      0       0     7.3
O     12
1    .12     .12     .14    .17     .18     .22     .70    2.40     .60     .30
1    .13     .12
T                                                   .5      .1
V    3.9     9.2       0
X      0       0       1
K      1      11                                    1
1    HYDROGRAPH ROUTING
Y      0       0       0       1       0
1      1
2      0      15      32      68     112     170     250     350     404     430
3      0     175     400    1200    2150    3080    4150    5200    5800    6150
K     99
A
A
A
A
A
```

****
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO 01
****

LAUREL SPRINGS LAKE DAM
BY J.CERAVOLO
JANUARY 1980

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	30	0	0	0	0	0	0	0

JOPER	NWT
3	0

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	0	7.30	0.0	0.0	0.0	0.0	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
12	0.0	0.0	0.0

PRECIP PATTERN

0.12	0.12	0.14	0.17	0.18	0.22	0.70	2.40	0.60	0.30
0.13	0.12								

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	0.50	0.10	0.0	0.0

UNIT HYDROGRAPH DATA
TC= 3.90 R= 9.20 NTA= 0

RECESSION DATA
STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

UNIT HYDROGRAPH 100 END-OF-PERIOD ORDINATES, LAG= 3.91 HOURS, CP= 0.34 VOL= 0.99

16.	61.	126.	203.	281.	347.	393.	411.	401.	380.
360.	341.	323.	306.	289.	274.	260.	246.	233.	221.
209.	198.	187.	177.	168.	159.	151.	143.	135.	128.
121.	115.	109.	103.	98.	92.	88.	83.	79.	74.
70.	67.	63.	60.	57.	54.	51.	48.	46.	43.
41.	39.	37.	35.	33.	31.	30.	28.	26.	25.
24.	22.	21.	20.	19.	18.	17.	16.	15.	15.
14.	13.	12.	12.	11.	11.	10.	9.	9.	8.
8.	8.	7.	7.	6.	6.	6.	5.	5.	5.
5.	4.	4.	4.	4.	4.	3.	3.	3.	3.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q

1	0.12	0.00	0.
2	0.12	0.00	0.
3	0.14	0.00	0.
4	0.17	0.04	1.
5	0.18	0.13	4.
6	0.22	0.17	15.
7	0.70	0.65	44.
8	2.40	2.35	135.
9	0.60	0.55	317.
10	0.30	0.25	572.
11	0.13	0.08	869.
12	0.12	0.07	1170.
13	0.0	0.0	1426.
14	0.0	0.0	1607.
15	0.0	0.0	1690.
16	0.0	0.0	1678.
17	0.0	0.0	1616.
18	0.0	0.0	1541.
19	0.0	0.0	1463.
20	0.0	0.0	1387.
21	0.0	0.0	1313.
22	0.0	0.0	1244.
23	0.0	0.0	1178.
24	0.0	0.0	1116.
25	0.0	0.0	1057.
26	0.0	0.0	1001.
27	0.0	0.0	948.
28	0.0	0.0	898.
29	0.0	0.0	850.
30	0.0	0.0	805.
31	0.0	0.0	762.
32	0.0	0.0	722.
33	0.0	0.0	684.
34	0.0	0.0	648.
35	0.0	0.0	613.
36	0.0	0.0	581.
37	0.0	0.0	550.
38	0.0	0.0	521.
39	0.0	0.0	494.
40	0.0	0.0	467.
41	0.0	0.0	443.
42	0.0	0.0	419.
43	0.0	0.0	397.
44	0.0	0.0	376.
45	0.0	0.0	356.
46	0.0	0.0	337.
47	0.0	0.0	320.
48	0.0	0.0	303.
49	0.0	0.0	287.
50	0.0	0.0	271.
51	0.0	0.0	257.
52	0.0	0.0	243.
53	0.0	0.0	231.
54	0.0	0.0	218.
55	0.0	0.0	207.
56	0.0	0.0	196.
57	0.0	0.0	186.
58	0.0	0.0	176.
59	0.0	0.0	166.
60	0.0	0.0	158.
61	0.0	0.0	149.

62	0.0	0.0	141.
63	0.0	0.0	134.
64	0.0	0.0	127.
65	0.0	0.0	120.
66	0.0	0.0	114.
67	0.0	0.0	108.
68	0.0	0.0	102.
69	0.0	0.0	97.
70	0.0	0.0	92.
71	0.0	0.0	87.
72	0.0	0.0	82.
73	0.0	0.0	78.
74	0.0	0.0	74.
75	0.0	0.0	70.
76	0.0	0.0	66.
77	0.0	0.0	63.
78	0.0	0.0	59.
79	0.0	0.0	56.
80	0.0	0.0	53.
81	0.0	0.0	50.
82	0.0	0.0	48.
83	0.0	0.0	45.
84	0.0	0.0	43.
85	0.0	0.0	40.
86	0.0	0.0	38.
87	0.0	0.0	36.
88	0.0	0.0	34.
89	0.0	0.0	33.
90	0.0	0.0	31.
91	0.0	0.0	29.
92	0.0	0.0	28.
93	0.0	0.0	26.
94	0.0	0.0	25.
95	0.0	0.0	24.
96	0.0	0.0	22.
97	0.0	0.0	21.
98	0.0	0.0	20.
99	0.0	0.0	19.
100	0.0	0.0	18.
101	0.0	0.0	17.
102	0.0	0.0	16.
103	0.0	0.0	15.
104	0.0	0.0	14.
105	0.0	0.0	13.
106	0.0	0.0	12.
107	0.0	0.0	10.
108	0.0	0.0	3.
109	0.0	0.0	1.
110	0.0	0.0	0.
111	0.0	0.0	0.
112	0.0	0.0	0.
113	0.0	0.0	0.
114	0.0	0.0	0.
115	0.0	0.0	0.
116	0.0	0.0	0.
117	0.0	0.0	0.
118	0.0	0.0	0.
119	0.0	0.0	0.
120	0.0	0.0	0.
121	0.0	0.0	0.
122	0.0	0.0	0.

123	0.0	0.0	0.
124	0.0	0.0	0.
125	0.0	0.0	0.
126	0.0	0.0	0.
127	0.0	0.0	0.
128	0.0	0.0	0.
129	0.0	0.0	0.
130	0.0	0.0	0.
131	0.0	0.0	0.
132	0.0	0.0	0.
133	0.0	0.0	0.
134	0.0	0.0	0.
135	0.0	0.0	0.
136	0.0	0.0	0.
137	0.0	0.0	0.
138	0.0	0.0	0.
139	0.0	0.0	0.
140	0.0	0.0	0.
141	0.0	0.0	0.
142	0.0	0.0	0.
143	0.0	0.0	0.
144	0.0	0.0	0.
145	0.0	0.0	0.
146	0.0	0.0	0.
147	0.0	0.0	0.
148	0.0	0.0	0.
149	0.0	0.0	0.
150	0.0	0.0	0.
SUM	5.20	4.29	40137.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1690.	1443.	764.	279.	40136.
INCHES		1.84	3.89	4.26	4.26
AC-FT		716.	1515.	1659.	1659.

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HYDROGRAPH ROUTING

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
11	1	0	0	0	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	0.

STORAGE=	0.	15.	32.	68.	112.	170.	250.	350.	404.	430.
OUTFLOW=	0	175.	400	1200.	2150.	3080.	4150.	5200.	5800.	6150.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	0.	0.
2	0.	0.	0.
3	0.	0.	0.
4	0.	0.	0.
5	0.	2.	1.

6	0.	10.	4.
7	1.	30.	14.
8	4.	90.	44.
9	10.	226.	115.
10	21.	444.	250.
11	35.	720.	476.
12	51.	1019.	818.
13	64.	1298.	1120.
14	76.	1517.	1366.
15	84.	1648.	1540.
16	89.	1684.	1629
17	88.	1647.	1640.
18	87.	1579.	1602.
19	84.	1502.	1540.
20	80.	1425.	1469.
21	77.	1350.	1396.
22	74.	1278.	1323.
23	70.	1211.	1254.
24	67.	1147.	1188.
25	65.	1086.	1124.
26	62	1029.	1064.
27	59.	974.	1007.
28	57.	923.	954.
29	55.	874.	904.
30	53.	828.	856.
31	50.	784.	810.
32	49.	742.	768.
33	47.	703.	727.
34	45.	666.	689.
35	43.	631.	652.
36	42.	597.	618.
37	40.	566.	585.
38	39.	536.	554.
39	38.	507.	525.
40	36.	481.	497.
41	35.	455.	471.
42	34.	431.	446.
43	33.	408.	422.
44	32.	387.	400.
45	31.	366.	385.
46	30.	347.	369.
47	28.	328.	351.
48	27.	311.	334.
49	26.	295.	317.
50	25.	279.	301.
51	23.	264.	285.
52	22.	250.	270.
53	21.	237.	256.
54	20.	224.	242.
55	19.	213.	230.
56	18.	201.	217.
57	17.	191.	206.
58	17.	181.	195.
59	16.	171.	185.
60	15.	162.	175.
61	14	153.	167.
62	14.	145.	158.
63	13.	138.	150.
64	12.	130.	143.
65	12.	123.	135.
66	11.	117.	128.

67	10.	111.	121.
68	10.	105.	115.
69	9.	99.	109.
70	9.	94.	103.
71	8.	89.	98.
72	8.	84.	93.
73	8.	80.	88.
74	7.	76.	83.
75	7.	72.	79.
76	6.	68.	74.
77	6.	64.	70.
78	6.	61.	67.
79	5.	58.	63.
80	5.	55.	60.
81	5.	52.	57.
82	5	49.	54.
83	4.	46.	51.
84	4.	44.	48.
85	4.	42.	46.
86	4.	39.	43.
87	4.	37.	41.
88	3.	35.	39.
89	3.	33.	37.
90	3.	32.	35.
91	3.	30.	33.
92	3.	28.	31.
93	3.	27.	30.
94	2.	26.	28.
95	2.	24.	26.
96	2.	23.	25.
97	2.	22.	24.
98	2.	21.	23.
99	2	19.	21.
100	2.	18.	20.
101	2	17.	19.
102	2.	17.	18.
103	1.	16.	17.
104	1.	15.	16.
105	1.	14.	15.
106	1.	13.	14.
107	1.	11.	13.
108	1.	6.	10.
109	1.	2.	7.
110	0.	1.	5.
111	0.	0.	3.
112	0.	0.	2.
113	0.	0.	1.
114	0.	0.	1.
115	0.	0.	0.
116	0.	0.	0.
117	0.	0.	0.
118	0.	0.	0.
119	0.	0.	0.
120	0.	0.	0.
121	0.	0.	0.
122	0.	0.	0.
123	0.	0.	0.
124	0.	0.	0.
125	0.	0.	0.
126	0.	0.	0.
127	0.	0.	0.

128	0.	0.	0.
129	0.	0.	0.
130	0.	0.	0.
131	0.	0.	0.
132	0.	0.	0.
133	0.	0.	0.
134	0.	0.	0.
135	0.	0.	0.
136	0.	0.	0.
137	0.	0.	0.
138	0.	0.	0.
139	0.	0.	0.
140	0.	0.	0.
141	0.	0.	0.
142	0.	0.	0.
143	0.	0.	0.
144	0.	0.	0.
145	0.	0.	0.
146	0.	0.	0.
147	0.	0.	0.
148	0.	0.	0.
149	0.	0.	0.
150	0.	0.	0.
SUM			40136.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1640.	1423.	759.	279.	40136.
INCHES		1.81	3.37	4.26	4.26
AC-FT		706.	1507.	1659.	1659.

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RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	1690.	1443.	764.	279.	7.30
ROUTED TO	11	1640.	1423.	759.	279.	7.30

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00400	2. GOVT ACCESSION NO.: AD-A085987
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): ~~Phase I Inspection~~ Report - National Dam Safety Program - Laurel Springs Dam (NJ00400) Delaware River Basin	5. TYPE OF REPORT & PERIOD COVERED: FINAL rept.
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): North Branch to Timber Creek, Camden County, New Jersey. Phase I Inspection Report.	8. CONTRACT OR GRANT NUMBER(s): DACW61-79-C-0011
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Louis Berger & Associates, ATTN: F.Keith Jolls, 100 Halstead Sts., East Orange, NJ 07019	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: NJ Department of Environmental Protection, Division of Water Resources, P.O. Box CN029, Trenton, NJ 08625	12. REPORT DATE: Mar 1980
	13. NUMBER OF PAGES: 45
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office): U.S. Army Engineer District, Philadelphia, Custom House, 2d & Chestnut Streets, Philadelphia, PA 19106	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Visual inspection
Structural analysis
Riprap
Spillways
Laurel Springs Dam, NJ
National Dam Safety Program

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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